

My Hobby: Building Barrel Organs



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by Lionel D C Hartley

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*Lionel spent almost 5 years in a wheelchair
with partial spinal paralysis but that didn't slow him down.*



The Beginnings

Introduction by a volunteer who has asked to remain anonymous

Lionel Hartley's interest in organ building began in the middle of last century when he was invited to spend his school holidays working with a pipe-organ builder in New Zealand on the restoration of a church organ. From there he went on to re-build and fully restore a dilapidated old reed organ on his own.

Through a school friend who's father had a business manufacturing spring steel products and another whose parents owned a music store,

Hartley was encouraged into the design and manufacturing of a number of musical saws. The blades for these were made by Coulter's Springs in Christchurch and the assembly, design, hand-carved handles, and engraving etc. was done by Hartley.

(You can read more about this at The Saw Lady's Website - www.sawlady.com/DifferentSaws.htm.)

Photo of Musical Saw, courtesy of www.sawlady.com



His first "barrel organ" was made as a stage prop for the Repertory Theatre Company and was only an empty cabinet with a moving handle.

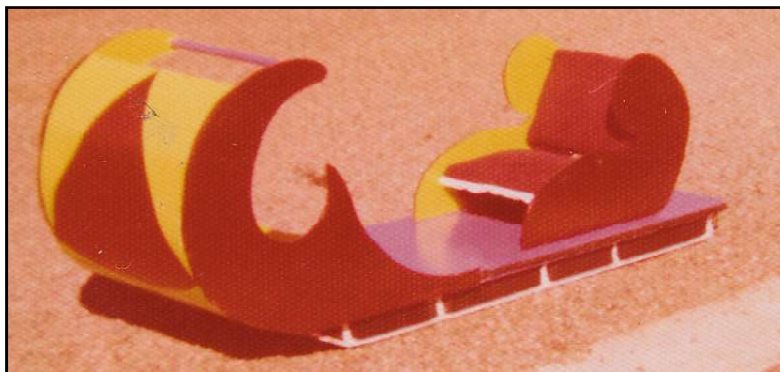
Because of his interest in making musical instruments and his skills in organ pipework he decided to make another one that actually worked.

This began a path that saw the building of quite a range of musical instruments over the years, including a large number of Jaw Harps, a 1/4-sized harpsichord, tuned cowbells and as many as seven working barrel organs and an analog synthesiser.



Lionel's home-made analog synthesiser (1960s)

Hartley also designed and built a huge range of stage props (such as giant strawberries made from unopened pine-cones, several full-sized Santa Sleighs, etc), marionettes, magician's apparatus and clown's props.



Sleigh Stage Prop (1978)

The two sides of this sleigh were each cut out of a square sheet of 5-ply plywood. Lionel planned it so that the sides of the seat shape and inner curve could be cut with a single sweeping arc to eliminate wasting material. The curved front is from three layers of 3-ply, steam laminated into a curve using a temporary shaped form made from scrap timber and the layers adhered together with hot glue. The runners are simply painted onto a wooden strip as the whole thing rides on a set of hidden casters. The rail at the front is from a discarded broom-handle. The seat is upholstered with red corduroy stretched over upholstery foam and finished with a piece of white lace.

Historical note

The original Fair Ground Barrel Organs (or Band Organs in the U.S.A) were first built around the early 1860's, and the sole purpose was to make a loud noise to attract the customers to rides. They were operated from a barrel that rotated that was

covered in pins, which was 'read' by a row of metal keys that would have to lift themselves over the pins on the barrel as it rotated and thus pulling various rods to sound the pipes which received air from a set of bellows or steam from a boiler (Calliope).

The Carousel Organ used folded cardboard 'books', which were either embossed or perforated.

The Street (monkey) organ is different to its fairground sister, it is far quieter and has a more relaxed sound, but at the same time being cheerful. Ambient music researchers agree that the sound of wind-pipes has a soothing and stress-defusing effect.

The heavy wooden or zinc barrel was replaced by a perforated paper roll which was 'read' by air pressure being released through the holes.



*Detail from an original
acrylic painting by Lionel Hartley*



*Christmas Barrel
Organ CD Vol 1*

How I make a Barrel Organ

A barrel organ consist of six major components:

Something to sound (the pipes, reeds or horns),
Something to make them sound (a set of bellows or a rotary air pump),

Something to control the sound (valves and trackers or solenoids),

Something to select the sound (roll of punched paper or midi device) and

Something to provide the energy to make it work (crank handle, gears and pulleys or electric motors).

The final component is a box to house it.

When I build a new organ I begin firstly with the bellows or their equivalent. This means that as I make each pipe I have some means of testing and tuning it.

The tubular and conical wooden pipes are

made on a lathe and tuned with stopped plugs. Larger (lath) pipes are long rectangular tubes made by sticking four thin slats of wood together with glue and carving a whistle for the end.

Wooden tubes that can be seen are layered with gold or aluminium paint before tuning.

The metal pipes are made from ordinary tubing with whistles hand-carved out of aluminium wedged inside below the flute-slot.

These are tuned firstly by their chosen length and more finely by moving the whistle plug up or down the tube.

Dummy pipes are also installed on the front of the instrument for decoration.

In addition to pipes, a barrel organ may have drums, acoustic woodblocks, reeds, tubular or conical bells, horns, cymbals or other musical instruments, for example, my ‘Organmagnifique’.

Unless you use pianola rolls (which I never have), the paper rolls need to be punched by hand. This was a long tedious process with a home-made craft knife shaped from a discarded hacksaw blade. The paper rolls were made by glueing several hundred foolscap pages end-to-end and rolling them on a wooden dowel.

This is made easier now-a-days by playing the music on a midi keyboard and printing the Event Listing onto a paper roll. This can then be slotted by hand with a craft knife. Or they can be left as printed black dots and lines so that a row of 'optical cells' (one for each note) can 'read' the dots and lines on the paper and relay this information to solenoids which operate the pipe valves.

On one or two more recent organs the rotating paper roll is purely decorative as the notes are sounded by digital MIDI or magnetic tape devices. My 20-pipe 'Kinderflutenpipe' organ uses a hand-embossed metal drum instead of a paper roll.





How does the instrument know which note to sound?

This is what the perforated roll is for.

Where the hole appears across the roll determines which note is sounded.

Where the hole appears along the roll determines when the note is sounded.

The size of the hole determines the volume.

The shape of the hole can also be used for effect:

If the hole is cut as a slot, the length of the slot determines the duration of the note (how long it is sounded).

Depending on the direction, a long triangular slot creates a diminuendo or crescendo effect.

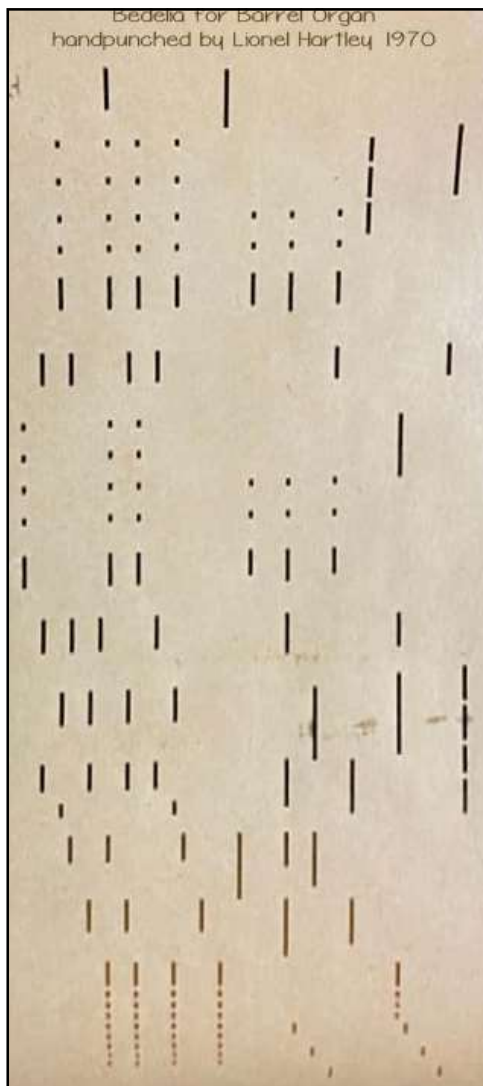
An elongated diamond shape combines the diminuendo or crescendo and if repeated a number of times it can be used for 'wah-wah' or siren effects.

By 'feathering' or zig-zagging (pinking) the edges of the slot a vibrato (or vox humana) effect can be created.

And a row of square holes very close together creates a staccato effect.

The holes are cut by hand to allow for the creation of special effects based on location, shape and size.

Mechanical cutters such as are used for commercially produced pianola rolls are usually limited to note selection and duration, and occasionally volume.



Other Barrel Organ Components

Pipes need to have valves operated by air, mechanical trackers or electric solenoids otherwise all pipes would sound at once.

The signal from the paper roll, digital MIDI or magnetic tape device selects which valves will open, for how long and (in some cases) by how much (controlling volume).

The organ needs a crank handle or electric motors to make it work.

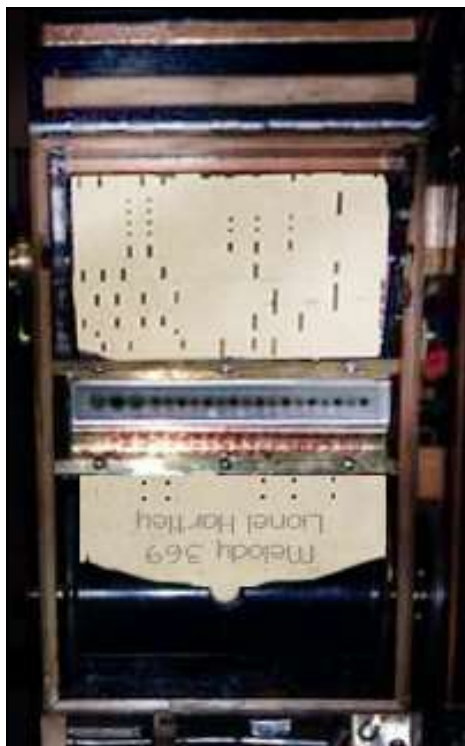
A series of pulleys or gears and levers operate the different parts and these also need to be squeezed into the cabinetry.

I prefer to use home-made wooden bearings (turned on a lathe from seasoned hardwood and lubricated with candle-wax) as these are quieter than metal commercially-made bearings.

The decorations are as much a part of the organ as the 'innards'. 'Kinderflutenpipe' has a

model carousel operated by a set of gears attached to the main drum-shaft (See illustration on page 20).

My 'monkey' organs have a rod-puppet monkey mounted on the top and the 'Organmagnifique' has operational bells, pipes, horns, drums and cymbals adorning the façade. Bright colours and scroll-work then add to the carnival atmosphere created by the music.



Interior of 38-pipe barrel organ

Kinderflutenpipe

Compact Barrel organ built in Australia
from a German design.

20 pipe German design street organ



This organ has a fully functioning miniature carousel and animated monkey puppet on the top which are linked by pulleys, levers and rubber belts to the main drive shaft.

It uses a hand-embossed metal drum instead of a paper roll (Each drum has eight simple tunes in concentric bands).

Extra drums are stored in a three-wheeled box which fits in underneath the organ.

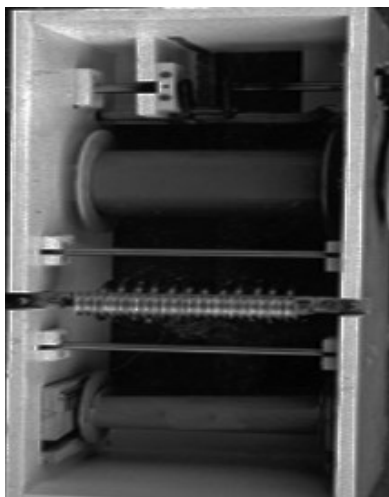
It also has a 12 volt magnetic tape driver which can over-ride the mechanical drum to control the 20 valves electrically.







Drum storage base



Interior

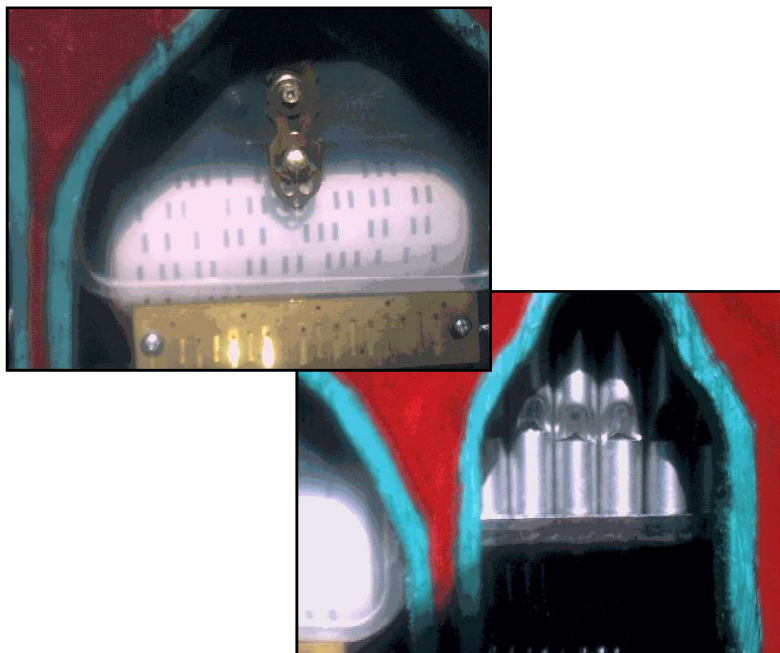
117 pipe Monkey Organ English Design

This is first of two identical-looking organs one with a paper roll (circa 1970) and the other with magnetised plastic tape (circa 1999).



There are 117 pipes made from aluminium and two banks of reeds modified from re-cycled harmonicas.

The internal tubing is soldered copper, not plastic or rubber as in most of the other organs. Each flexible copper tube is joined to the respective aluminium pipe by freeze-shrinking the end of the copper tube and wedging it into a tight-fitting hole bored into wooden plug which, in turn, is wedged into the whistle-end of the pipe. As the copper tubing warms back to room temperature it expands a minute fraction, forming an air-tight seal.



38 pipe "Faque" Midi Barrel Organ

This reproduction organ was purpose built for Lynette Sauer (The Fairy Lady), Armidale, NSW for use in street parades and for display. The design is similar to one that I built 30 years earlier.





It is a reproduction organ and the pipes are imitation and for show only. Although it has moving parts, the sound is pre-recorded from an earlier built 38-pipe barrel organ and played through a home-made aluminium conical speaker that very realistically mimics the dynamic range of the original.

It has an animated monkey puppet mounted on the top that is operated by a lever (controlled by the organ-grinder's left hand).

70 pipe "Faque" Midi Barrel Organ

This reproduction organ was purpose built for Kenneth Graham (*Not the author of Wind in the Willows*). Kenneth is located at Murwillumbah, NSW, and this organ was made for use in market or street-side busking, magic acts and at National magician's conferences, etc.





It has an animated monkey puppet mounted on the top that is operated by a lever (controlled by the organ-grinder's left hand). The design is based upon one I built in the 1970's.

It is a reproduction organ only and the pipes are imitation and for show only. Although it has moving parts, the sound is pre-recorded from an earlier built 70-pipe all-wooden barrel organ and, like my other "Faque" organ the sound is played through a home-manufactured aluminium conical speaker that very realistically mimics the dynamic range of the original.

The Organmagnifique

This 1000 pipe, reed & percussion barrel organ was built in Australia and is an original design.



This electro-mechanical organ uses a 16-track midi driver, and has 960 pipes in two ranks, a rank of 64 horns, a base drum, two cymbals, a set of 16 bells, and 32 brass reeds in two sets. (Not shown

are the two solenoid-controlled snare-drums which also attach to the top).



The bass drum in the centre looks to be the wrong way around but this is because the mechanical drumstick is operated from behind, throwing the sound forwards. It took about five years to build.

The wind source is a 110v rotary brush-less motor re-cycled from an old electric reed organ (which is where I obtained the two banks of reeds.)

By overlapping the pipes and horns (see photo below) and using flexible tubing, I was able to compact it to a tiny cabinet only seven feet wide by five feet tall and only two-foot-six-inches deep.

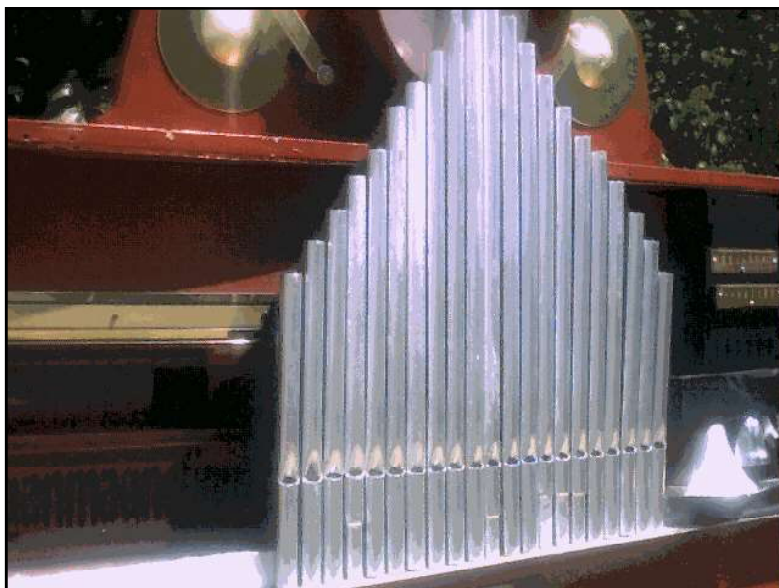




Illustration by Peter Jackson

The Organ Grinder

I was entertaining a few years ago with one of my 'monkey' organs, when an observer commented that the winding of the handle on the organ looked like the turning of a roast on a barbecue, except that the “barrel organ made a much better sound”.

This later prompted me to write the following nonsense poem, 'The Organ Grinder':

His first time at a barbecue,
The organ grinder watched in awe
As his neighbour turned the sizzling roast
Upon the spit
Above the glowing fire.

His arm in rhythmic motion
Emulated the grinder's trade
Yet the only sound
Was a hiss and a crackle
From the cast-iron box he 'played'.

(Continued overleaf)

The organ grinder, puzzled, watched
And finally exclaims,
"I don't know what you're playing,
But...
Your monkey's up in flames!"

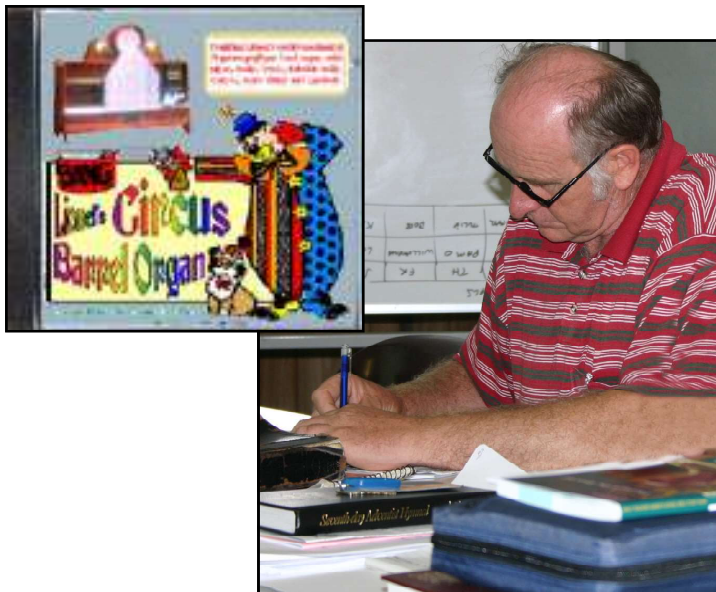
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Postscript

Sadly, the ‘Organmagnifique’ 1000 pipe barrel organ was destroyed in 2006 by a Tweed River flood in Murwillumbah, NSW, but not before a number of circus music recordings were made. So the sound lives on.

Audio files and Karaoke Videos using sounds of these organs are available online free at
https://archive.org/details/@red_range_radio



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